

AN11909

How to create an Installation Identifier (IID)

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Application note
COMPANY PUBLIC

Document information

Info	Content
Keywords	IID, Installation Identifier, MIFARE Plus, MIFARE Plus EV1, MIFARE DESFire EV2, Virtual Card
Abstract	This document defines how Installation Identifiers (IIDs) used in the MIFARE Virtual Card architecture are allocated.



Revision history

Rev	Date	Description
1.0	20161114	Initial version

1. Symbols and abbreviated terms

AID	Application Identifier
CID	Card Identifier
IC	Integrated Circuit
IID	Installation Identifier
MAD	MIFARE Application Directory
NUID	Non-Unique ID
PCD	Proximity Coupling Device
PICC	Proximity Card
PIX	Proprietary Application Identifier Extension
RID	Registered Application Provider Identifier
UID	Unique Identifier
VC	Virtual Card

2. Introduction

This document describes how to allocate the Installation Identifiers (IID) in the Virtual Card Architecture deployed in MIFARE Plus, MIFARE Plus EV1 and MIFARE DESFire EV2.

Depending on the IC product, the PCD uses different commands for the Virtual Card Architecture in order to express which installation(s) the PCD belongs to. The IID is 16 bytes long and must be unique.

MIFARE Plus

The virtual card commands listed here are native commands and only valid for the older version of the MIFARE Plus and not valid for the new evolution any more.

- Virtual Card Support (VCS) – Command Code 0x42
- Virtual Card Support Last (VCSL) – Command Code 0x4B
- Select Virtual Card – Command Code 0x40
- Deselect Virtual Card – Command Code 0x48

MIFARE Plus EV1

The command VCSupportLastISOL3 is intended for VC selection on ISO Layer 3 (ISO/IEC 14443-3), the other two commands are intended for VC selection on ISO Layer 4 (ISO/IEC 14443-4).

In addition to this, the two ISO Layer 4 commands are compliant to ISO/IEC 7816-4 standard.

- VCSupportLastISOL3 – Command Code 0x4B
- ISOSelect – INS 0xA4
- ISOExternalAuthenticate – INS 0x82

MIFARE DESFire EV2

These two commands operate on ISO Layer 4 (ISO/IEC 14443-4) and are compliant to ISO/IEC 7816-4 standard.

- ISOSelect – INS 0xA4
- ISOExternalAuthenticate – INS 0x82

3. Objectives for the IID assignment process

3.1 Uniqueness

The process must yield a unique IID for every installation

3.2 Simplicity

The process must be simple, such that people who make installations are encouraged to allocate a unique IID to each installation.

3.3 Availability

The allocation process must be obtainable 24/7 “twentyfourseven”. At whichever time someone needs an IID, it must be promptly obtainable.

3.4 Privacy

There may be resistance against NXP knowing information about which installations exist and who owns them. Therefore privacy is important to avoid that people just allocate some own IID which would no longer be unique.

4. The mechanism

4.1 Considerations for getting a unique number

The method of IID allocation is self-allocation. NXP just publishes this scheme and everyone can allocate the number without NXP being involved.

For this some source of unique number is needed. The choice is made for a source of unique numbers that NXP generates anyway and which is easily obtainable to the target community. This is the 7-byte UID of a MIFARE Plus, MIFARE DESFire, MIFARE Ultralight or SmartMX card.

Alternatively the MAD Identifier can be used as it is used for MIFARE Classic.

Table 1. IID Allocation Scheme

Variant	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
7 byte UID	0xA0	0x00	0x00	0x03	0x96	0x56	0x43	0x41	0x01	UID0	UID1	UID2	UID3	UID4	UID5	UID6
AID	0xA0	0x00	0x00	0x03	0x96	0x56	0x43	0x41	0x03	M0	M1	M2	0x00	0x00	0x00	0x00
Default for MIFARE Plus	0xA0	0x00	0x00	0x03	0x96	0x56	0x43	0x41	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF
Default for MIFARE DESFire	-	-	-	-	-	-	-	-	-	0xD2	0x76	0x00	0x00	0x85	0x01	0x00
Explanation	International RID for PIX (assigned to NXP) according ISO 7816-5					Virtual Card Architecture (VCA)			Variant ID	UID, MAD ID or default bytes, and filler bytes						

UID0 ... UID6 7 bytes from the UID

 UID0 is the first byte as it is transferred over the air, then UID1 etc.

M0 ... M2 3 bytes from the MIFARE DESFire Application ID MAD ID

 M0 = MIFARE DESFire AID byte 0

 M1 = MIFARE DESFire AID byte 1

 M2 = MIFARE DESFire AID byte 2

The way to transform a MIFARE Classic AID into a MIFARE DESFire AID is as specified in [1].

MIFARE DESFire AID Byte 0		MIFARE DESFire AID Byte 1		MIFARE DESFire AID Byte 2	
Nibble 0	Nibble 1	Nibble2	Nibble3	Nibble4	Nibble5
0xF	MIFARE classic AID				0x0 .. 0xF

Fig 1. MAD for MIFARE DESFire

5. The process

The process that needs to be followed is:

5.1 MAD has been allocated to the customer's installation / application

If an MAD ID has been allocated for the installation / application of the customer, then the IID is as stated in the table above using the row MAD ID.

5.2 MAD has not been allocated

If no MAD ID has been allocated for the installation of the customer, then the customer (or the installer acting on his behalf) must:

1. Take a MIFARE card (MIFARE Plus, MIFARE DESFire, MIFARE Ultralight or SmartMX).
2. Use an application to read out the card UID. (Note: If the card possesses a 4 byte NUID we highly recommend to use another card which is characterized through a 7 byte UID to guarantee uniqueness)
3. Clearly mark the card that this is the card that has been used to derive the IID from.
4. Make sure that the UID stays readable, so do not configure the card into Random ID. Actually, after reading out the UID do not further interact with it.
5. Lock the card away so that it can be demonstrated that the IID was correctly allocated. Don't use this card but keep it only as a reference and UID-source.
6. Compose the IID using the table above using the 7 byte UID that was read from the card.

6. List of References

- [1] AN10787 MIFARE Application Directory (MAD)

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7.1 Definitions

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